

# Treatment of Tuberculosis

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## THE CURABILITY OF TUBERCULOSIS

ONE of the greatest triumphs of present-day medicine is the successful treatment of tuberculosis. For nearly nineteen centuries of the Christian era tuberculosis was considered hopeless. Then its infectious nature was discovered; the tubercle bacillus was proved to be its cause; the clinical aspects of the disease were understood, and to the great surprise of the scientific and lay world it was shown to be a curable disease. Without hesitation we now can say that tuberculosis is a curable disease—not only a curable disease but one which, if treated early, as all diseases should be, is probably the most curable of all the serious maladies.

In order to understand the curability of clinical tuberculosis it is necessary to understand what is meant by the term cure. We cannot speak of it in the same way that we speak of cure in the acute infections, because if the disease is at all widespread, bacilli remain in the tissues capable of escaping, multiplying and forming new foci of disease at some future time when conditions are favorable. The meaning of this term can be clarified by discussing the succession of events

which takes place from the time of infection to the time of the developing of clinical symptoms.

Tuberculosis is not a disease which follows immediately on infection after a given incubation period; but it is one in which there is a succession of infections taking place over a period of months or years—often several years, before the disease manifests itself with clinical symptoms, viable bacilli remaining in the tissues all the while. This statement takes into consideration the usual type of tuberculosis—not the acute disseminated type, which as a rule occurs only in early life.

It is not only necessary to understand this succession of infections but it is also necessary to understand that each one of these infections which occurs results in a change in the body cells which grants to them an increased capacity for warding off further infections. In other words, every time an individual successfully combats an infection his ability to withstand further infections with larger numbers of bacilli is increased. As a part of this immunizing mechanism, the body cells take upon themselves the property of inflammatory reaction, which manifests itself whenever tubercle bacilli or their products come in contact with them. This reaction has a tendency to destroy bacilli and failing that to hem them in

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and prevent their egress from the point of inoculation. During the natural progress of the disease this also occurs about foci of infection and is an integral and necessary part of healing.

Two separate processes take place in tubercle, one proliferative with a tendency to the formation of fibrous tissue; the other destructive, with a tendency to necrosis and liquefaction of the tissues. The tendency to necrosis and liquefaction is greater when the infection is caused by many bacilli or is implanted in tissues which offer little resistance. Small infections are nearly always unrecognized. The body cells take care of them without the patient even suspecting their presence; in other words, without appreciable changes in the normal physiologic action of the body cells.

When the disease becomes what is termed clinical tuberculosis, it means that the infection has reached the stage where it disturbs the normal physiologic working of the body cells and makes its presence known by symptoms. The forces of the body, if properly marshaled when symptoms first make their appearance, are nearly always sufficient still to overcome the invaders; but there is no time for delay. When the disease becomes a clinical entity by the production of symptoms, it means that the patient must raise the fighting power of his cells, his specific defensive mechanism, to the point where it can cope with the tubercle bacilli, or the disease will continue spreading and increasing in severity. Therefore when the disease once manifests itself as a clinical entity, immediate care of the patient is imperative.

If such an ideal condition could be brought about that every patient manifesting clinical signs immediately would be given adequate treatment, practically all would heal. This does not mean that more advanced cases cannot heal. With proper conservation of the patient's forces, it is surprising what extensive pathologic lesions can at times be overcome.

#### STATISTICS MISLEADING

The statistics of sanatoria are too often taken as representing the curability of tuberculosis. Nothing could be farther from the truth. While we recognize that sanatoria offer the best conditions under which tuberculosis may be treated, it does not mean that all patients whose names appear on the discharged list have secured sufficient and adequate treatment. Sometimes this is the fault of the patient, sometimes the fault of those in charge of the institution, and sometimes the fault of circumstances which seem to be insurmountable; but too often it is due to the fact that regardless of conditions the patient convinces himself that he will do as well or better outside the institution.

One very unfortunate practice in making up statistics of sanatoria is that of counting all patients who have been in the institution three months or more. It seems to me that those who have been interested in the treatment of tuberculosis do not sufficiently appreciate the discouraging influence of such false statistics. Such a method of determining statistics is no more absurd than it would be to report results of operations on a time basis, if we could conceive of such a thing as operating some patients for ten min-

utes, others for fifteen, and so on, and finally others until the operation was satisfactorily completed, and yet counting all in making up the statistics of curability. The statistics of curability of tuberculosis should only include patients who have received adequate treatment.

The statistics of sanatoria, rather than showing the degree of curability of tuberculosis, show the degree to which the patient's problems are being met and the degree to which his cooperation is being obtained, which emphasizes the fact that the treatment of the patient is of greater importance than the treatment of the disease.

No tuberculous process is cured in three months, and a very few arrestments occur in that time. To be sure, a certain proportion of favorably reacting patients, whose cells have high resisting qualities, may gain sufficient help during a three months' stay in an institution so that they may go on and complete the cure; but the only true basis on which statistics of the curability of tuberculosis can be based is the same as in all other diseases and that is "adequate treatment."

Adequate treatment will vary according to the extent and character of the lesion present; the resisting power of the patient; the intelligence of the program instituted, and the coöperation of the patient. But even in the earliest stage of the disease, the time of treatment will vary greatly with different patients. One patient will secure a satisfactory result in five or six months, where another patient with apparently the same lesion will require a year or two years, and occa-

sionally longer. The individual reaction of the patient determines largely the length of time necessary to procure a satisfactory result. I have seen early cases of tuberculosis that required as much as two years to attain an arrestment. Had treatment stopped in six months or a year, failure would have resulted; but by continuing as long as necessary and not being bound by a time limit, a favorable result was attained—a result that was lasting.

The low percentage of favorable results which are reported from sanatoria collectively, including patients in all stages of the disease, from all walks of life, representing different degrees of efficiency in treatment and various degrees of cooperation on the part of the patient and the patient's friends, and carried out usually for insufficient time, still, if properly considered and analyzed, shows much to encourage the tuberculous patient who seeks restoration to health.

The fact can be extracted from these statistics that early tuberculosis when treated adequately, will nearly always yield a favorable result, and even advanced and far-advanced forms will yield sufficiently often to make the attempt to get well well worth while.

#### INTELLIGENT GRASP OF THE NATURE OF THE DISEASE NECESSARY

I consider it most essential for the physician who treats tuberculosis to be able to visualize what is going on in the tuberculous process; the way that it is affecting the physiologic equilibrium of the patient, and the manner in which the defensive mechanism of the patient is opposing the

infection. If the physician can do this, he then can direct more efficiently the patient's therapy.

I consider it equally important to make the patient conversant with the nature and course of tuberculosis, particularly if he comes from the intelligent classes. An understanding of the underlying principles of therapy and the reason for employing the various measures secures his coöperation in a manner that cannot be had when the patient is kept in ignorance. I always have been able to remove most successfully the fears of the patient, and to secure his willingness to follow out the course of treatment, by explaining to him what we are attempting to do and the reason for the same.

#### NECESSITY OF TREATING THE PATIENT RATHER THAN THE DISEASE

We are just now ready to enter upon the physiologic era in medicine. While structural change, as taught in pathologic anatomy, has dominated medicine during the past three-quarters of a century, almost to the exclusion of pathologic physiology, the time has now come to change our point of view. We now see that it is not pathologic anatomy alone that is the important thing in medicine but pathologic anatomy plus pathologic physiology. Changes in structure are of little consequence unless they disturb the normal working of the body cells and organs. As long as a patient can maintain physiologic equilibrium he is in a normal healthy state. So we must change our attitude toward disease.

My conception of the symptomatology of disease makes the patient primary rather than the pathologic

process. The symptom complex represents the way that the patient's cells and organs, with his own particular physiologic equilibrium, are able to react in the presence of the pathologic process. The cure of disease consists in raising and maintaining the patient's physiologic cellular activity at such a standard of efficiency that he can overcome the pathologic process. If this cannot be done, cure cannot result. Therefore, a true and comprehensive conception of clinical tuberculosis consists not only of a knowledge of the disease, but also an understanding of the patient and the manner in which his body cells are able to function in the presence of his tuberculous pathology. This comes far from meaning that all his symptoms are being caused by the tuberculosis—far from it; because he has many other things that disturb his physiologic equilibrium.

Whoever will treat tuberculosis successfully must recognize that these patients are thinking, hoping human beings, with the same desires and ambitions as others. He must further understand that physiologic equilibrium may be disturbed just as much from psychical as from physical stimuli. The manner in which the tuberculous patient adjusts himself to his various problems is of great importance, and the adjustment required is usually great.

A patient with tuberculosis experiences a sudden check to all his ambitions. To illustrate, let us take a young man of the middle class of society, in his twenties. He probably is contemplating marriage, or, he may already have a wife and children; he is starting or contemplating start-

ing a profession or business, which must be relinquished for the time being; and, he is probably making for himself or family a place in social life, all of which must be interrupted. He has not yet had time to accumulate sufficient funds for his treatment, so he must fall back on inherited money, or call on friends or charity for help. He is required to isolate himself from all his usual activities of life and to change his entire method of thinking and acting until cure has been effected. Then, too, he must always face the possibility of failing to regain health. These are only a few of the big problems that affect his cellular activity through his psychical equilibrium. The result is a tremendous psychical trauma—if we may so speak of it—which in many instances disturbs his physiologic cellular activity far more than the disease present. He must fight his tuberculosis then either with his psychical trauma, or the psychical load must be relieved. It rarely can be removed wholly but it can be minimized by approaching these patients in a sympathetic way with an interest such as that which characterized the old family physician and made him mean so much to his patients.

The physiologic method of approach should always be emphasized in the presence of chronic disease. The more nearly that we can maintain physiologic equilibrium the more successfully will the patient combat his disease. The actual healing of tuberculosis depends upon the specific immunizing mechanism carried on by the body cells; but the manner in which the cells react with this specific defense depends upon their physiologic reacting power.

So in treatment let us direct our

minds to the patient and less to the disease, because the patient in physiologic equilibrium will take care of his disease if it is in a state where it can heal. It must also be understood that physiologic equilibrium often differs in different individuals. Some people carry on their life's work very inefficiently because their equilibrium is usually disturbed. Others carry on just at the border of efficiency. They have no reserve. As long as everything goes all right they are able to do their work; but let excessive worry, disappointment or a diseased condition enter, and their physiologic activity is markedly disturbed. Others carry on their work by taking excellent care of themselves and so are able to get along without marked disturbance. Then, there is another group made up of those who have a large margin of safety. They stand the various crises in life well. Their physiologic equilibrium maintains itself throughout extraordinary conditions of stress. Those belonging to this group have the best chance in fighting any disease. These variations in individual physiologic equilibrium should be recognized in practice.

Oftentimes, just a little aid in the adjustment of problems, in meeting disappointments, in relieving worries, and in overcoming other psychical problems, as well as relieving those things which cause physical stress, will help tremendously in the cure of tuberculosis. By improving physiologic equilibrium, it will improve the specific defensive mechanism of the cells and thus aid in healing.

#### IMPORTANT FACTORS IN THERAPY

When the factors which have proved to be of greatest value in the

treatment of tuberculosis are analyzed it will be seen that nearly all have the definite purpose of improving the patient's general condition by restoring and maintaining physiologic equilibrium so that his body cells will be able to put up a strong defense.

*Open air.* Our ideas of open air have changed greatly during recent years. The most important fact to be grasped is that we are not treating patients in the open air because of an increase in the intake of oxygen requirement; but we are putting them in the open air so that they might get the natural stimulus that comes from open air in motion. This new conception has nullified some of our former arguments in favor of making patients endure the rigors of cold and inclement weather. We now know that such exposures are not necessary and further that they are not always advisable.

The essential factor in open-air treatment is an atmosphere which is in a process of continuous circulation. It is also advantageous to have it as free as possible from pollution of all kinds.

*Rest.* The most universally recognized measure in therapy today is rest. It is a safe principle to follow that no patient should exercise during the period that the disease is producing toxic symptoms. Toxic symptoms depend upon the toxins escaping from the focus of infection and gaining access to the blood-stream. These symptoms differ according to the manner in which the individual's body cells withstand the action of toxins; other things being equal, according to the amount of toxins that find their way into the blood-stream.

When a patient is at rest four or five liters of blood pass through the lungs per minute, while during work it may be increased to twenty liters a minute. The ventilation of the lungs is also correspondingly increased. While at rest, the patient will use from 250 to 300 cc. of oxygen per minute, on moderate work it requires from 600 to 1600, and upon hard work from 1750 to 2100.

Thus it will be seen that two conditions very unfavorable to the patient are brought about by exercise: first, an increase in the ventilation of the lung, including the diseased area; second, an increase in the circulatory process, also including the diseased area, both of which have a tendency to increase the amount of toxins in the circulation.

From this it readily can be seen that rest is an essential factor in treating patients when toxic symptoms are present; and during that period when toxic symptoms would be produced if the patient's bodily activities were not controlled.

*Exercise.* While rest is essential during the active period, exercise is just as important when the proper time comes. Consequently, when the patient arrives at the stage in which he is able to take exercise and still maintain physiologic equilibrium, it should be prescribed. The amount of exercise that a patient should take is that which is adapted carefully to his particular reacting powers.

Exercise demands increased metabolism and calls for a relative increased amount of food. Unless the patient can take this and his digestive and assimilating powers are capable of caring for it, he cannot safely go on

with his exercise. In other words, digestive and metabolic balance are factors of prime importance.

In order that the patient may maintain a digestive and metabolic balance, exercise must not cause an increase in circulating toxins. His respiratory system must be adequate; his heart and circulatory system must be able to respond efficiently; his muscular tone must be such that the toxins produced therein by the exercise will be quickly eliminated.

Exercise should, under no circumstances, cause toxic symptoms, or shortness of breath, or tiring from which the patient does not recover after a few minutes' rest. Any departure from this rule we recognize as indicating that the amount of exercise is not adapted to the patient's condition.

*Food.* The question of diet in tuberculosis is going through changes in the minds of medical men at this time, and one cannot be too dogmatic in prescribing. It is my opinion that the best diet for the average tuberculous patient consists of three meals a day, made up of a wide variety of foods, including a moderate quantity of meat, a goodly supply of green vegetables and a good quantity of milk. Milk is the most complete of all foods. It contains large quantities of calcium which is valuable, and also the various vitamins which are necessary for adequate nutrition.

The three meal system of eating should not be supplemented by more frequent feedings unless special circumstances should arise. However, if a patient cannot take sufficient quantities of general food for any reason, then it is advisable to use milk, or

milk and cream, every two or two and one-half hours, beginning with small amounts and increasing until a couple of quarts a day are being taken.

There is no necessity for raising a patient's weight far above normal. A healthy state of nutrition—not fat—should be the aim.

Among the important adjuncts to diet we must mention cod-liver oil. Formerly we thought that it was a nauseating form of fat, but we now look upon it as a valuable stimulant to nutrition almost indispensable in certain conditions. We have found its value so great that we are almost making ourselves believe that it is palatable.

*Heliotherapy.* Since the popularization of heliotherapy in the treatment of surgical tuberculosis by Rollier, the use of this important measure has been greatly emphasized. Some have felt that tuberculosis of the lung was not suitable for heliotherapy. Personally, I have no sympathy with this opinion. I have used heliotherapy in the treatment of tuberculosis since 1898. If one has a conception of what heliotherapy means, he will see that it is a very different thing from that which is usually described. Heliotherapy means light therapy. Even diffuse light contains the rays of the spectrum. From the usual discussion one would feel that heliotherapy means treating patients with ultra-violet rays alone.

In order to understand heliotherapy it is necessary to realize that the body is a machine endowed with many receptors which take up energy from without and transform it into action within the body. When we realize the importance of light to the animate



world we can not doubt that light is one of the most important sources of stimulation. Light exerts an energizing influence on the organism through its action on the surface of the body. It produces both directly and indirectly, through the body fluids and the nervous system, far-reaching effects upon the patient's metabolic activity and, if properly dosed, improves his general physiologic reaction. We assume that an increased reaction against disease is brought about in this way.

A great deal of harm is being done today by subjecting patients who have active tuberculosis, and particularly active febrile tuberculosis, to the direct sun's rays. Too often too the exposure is carried out while the patient's body is clothed. When the body is clothed, particularly if the clothing is thick or made up of several garments, it interferes with free exchange between the body and the air and consequently produces the same effect as that caused by being shut up in a stuffy room.

The direct rays of the sun increase metabolism; consequently are apt to cause a temperature rise; and if the patient is in a toxic state, owing to the disparity between heat production and heat elimination which is frequently present, such a rise may continue for some time. No tuberculous patient should undertake to use heliotherapy unless he understands the principles of its use. It is only afebrile quiescent cases that should be subjected to the direct rays of the sun and these very cautiously until their individual reaction powers have been determined; all patients on the other

hand may be exposed to indirect rays as found in diffuse light.

The direct bactericidal influence of heliotherapy in the body is very much overestimated; but the influence of light in increasing the defensive mechanism of the individual is undoubtedly great.

*Psychology* As previously stated in this paper, creating a helpful psychology for the tuberculous patient is one of the most important factors in therapy. If the physician can relieve the patient of his worries and fears, help him to solve his troublesome and depressing problems, give him the optimism that is warranted by modern therapy, and keep him contented over a long period of time, he is putting him in that condition in which his body cells will react most favorably and be best able to overcome the disease.

*Tuberculin.* Tuberculin is a remedy that is not used as extensively as its value warrants, for it is the one remedy that we possess by which we are able to stimulate the tuberculous focus and bring about conditions which are essential to cure. In the presence of the allergic state tuberculin, when injected, produces an inflammatory reaction about the foci of infection, which favors healing. This reaction may be of any degree of severity, consisting of only a slight hyperemia in the focus with the gathering of a few cells, or a stimulation so severe as to cause a destructive process; but, since the degree of reaction can be controlled by the physician if he understands the remedy and the disease, severe dangerous reactions can be avoided

*Artificial pneumothorax.* Artificial pneumothorax is not a cure for tuberculosis but a method of treating a certain group of serious cases which, without it, would usually prove to be hopeless. It is of particular advantage in those cases in which the activity is wholly or almost wholly confined to one lung in which, in spite of the best care and treatment, the disease is extending and threatening extensive destruction. It also may be used to collapse certain cavities. It is particularly valuable in those cavities which are not surrounded by dense walls. In patients who form scars readily and in those with thickened and adherent pleura, collapse is very difficult to obtain.

*Surgery.* In recent years there has been more and more effort made to do something more for those patients in whom a favorable result is not attained by ordinary methods of treatment. It has been found that in many instances in which an active disease, largely confined to one lung, fails to heal under the usual treatment, surgical intervention may avail. In such cases cavities may be in the process of forming, or they may be already formed; or, the disease may be extending regardless of all measures used to increase the patient's fighting qualities. In many such instances extensive pleural adhesions are present and a collapse by artificial pneumothorax is impossible. By cutting the phrenic nerve and removing a portion of the ribs a sufficient collapse can be had in a certain percentage of such cases, so that a satisfactory result may be attained.

If tuberculosis were treated at the right time most of the therapeutic

problems would be connected with the psychological handling of the patient, and the securing of his hearty cooperation in the application of such principles as rest, exercise, food and heliotherapy—principles which are directed toward establishing a good physiologic equilibrium and the problems that come more particularly from the advancement of the disease, with its destructive processes, would be avoided. Inasmuch, however, as a very large percentage of the patients whom we are still treating continue to be those advanced and far-advanced in the disease, it is necessary to devise methods for meeting their problems. To this end, pneumothorax and chest surgery have been brought forth, and are proving efficacious in well chosen patients.

*Climate.* A change of climate is not essential for the cure of tuberculosis. Tuberculosis will heal in any climate. The most important factors in treatment are a physician who knows tuberculosis and a patient who will cooperate. These can be had in any climate. We must not go so far, however, as to say that climate exerts no influence upon the physiologic mechanism of the patient. There are tremendous adjustments required by the daily changes which take place in the physics of the atmosphere. The patient who is able to meet these requirements and still maintain a physiologic balance has better chances of cure than the one who is unable to do so. Therefore, it stands to reason that the individual who, during periods of comparative health, meets changes in the physics of the atmosphere with difficulty, will be better able to combat his tuberculosis if he is under condi-

tions of weather and climate which make comparatively small demands upon his physiologic adjustment.

*Home versus sanatorium.* I have briefly outlined some of the more important measures employed in the treatment of tuberculosis. The next question is where shall they be applied—in the home or in a sanatorium.

The sanatorium is a specially designed institution with a specially created atmosphere adapted to meet the requirements of those suffering from tuberculosis. Because of the chronic nature of the disease and its special requirements in treatment, segregation and isolation of the patient has seemed necessary to give him best chances of cures. Inasmuch as it is necessary to maintain a high standard of physiologic activity for a long period of time, the patient's chances of improvement are best when he is relieved of the annoyances and worries

of the home, the worries and cares of business, and the various domestic problems which continuously arise and demand for their solution the expenditure of much energy.

While there can be no ideal place for treatment, the well conducted sanatorium comes the nearest to this. All patients, however, cannot be treated in institutions. If they cannot, conditions in the home must be made as near like those which obtain in the sanatorium as possible. This is not so difficult as far as the arrangement of the accommodations are concerned; but to create the atmosphere of helpfulness and hopefulness, and to provide the optimistic attitude and helpful coöperation of those who administer to the ill is almost impossible. Patients can get well either in the home or in institutions, provided the problems peculiar to each individual can be successfully met.